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REMARKS

Claims 1-2 and 4-6, and 10-23 remain pending in the application. Claims 3 and 7-9 have been canceled. Claims 1, 4, and 6 have been amended.

I. Response to Current Office Action Mailed March 14, 2002

In the most recent office action mailed March 14, 2003, the Examiner rejected the pending claims in view of U.S. patent no. 6,106,678 to Shufflebotham et al. ("the Shufflebotham patent"), considered alone or in combination with other art. These rejections are overcome as follows.

Pending independent claim 1 has now been amended to recite that a first component flowed during the deposition process consists of ozone:

1. (Amended) A deposition method capable of filling recesses in a substrate, the method comprising:
 - (a) providing a substrate having recesses defining side walls and recess bottoms;
 - (b) exposing the substrate to an energized deposition gas comprising a first component comprising ozone and a second component, to deposit a first layer of a material in the recess at different rates over the side walls and recess bottoms; and
 - (c) reducing the ratio of the first component to the second component, to deposit a second layer of the material over the first layer in the recess.

The other independent claims 13 and 20 pending in the application already recite a process utilizing ozone during deposition.

Nowhere does the Shufflebotham patent teach or even suggest using ozone in a gap filling deposition process, as is now recited in each of independent claims 1, 13, and 20. In fact, the Shufflebotham patent relied upon so heavily by the Examiner contains only a single reference to ozone:

ECR/TCP-CVD ion bombardment plays a key role in the deposition process not only by the activation of surface reactions, but also by simultaneous sputtering that prevents premature closing of the trench top and formation of voids. Sputtering enables high aspect ratio features to

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be filled from the bottom up. The latter mechanism results in void-free filling of sub-0.5 μm features, a task very difficult to accomplish with TEOS and TEOS/O₃ based processes. (Emphasis added; col. 9, lines 11-17)

Contrary to the assertion of the Examiner, the Shufflebotham patent thus actually teaches away from an ozone-type deposition process in accordance with the pending claims. In particular, the Shufflebotham patent specifically differentiates itself from ozone-based processes due their inability to accomplish the desired "void-free filling of sub-0.5 μm features". This statement cannot be interpreted by the Examiner as providing support for the proposition that the Shufflebotham patent teaches or suggests reducing an ratio of ozone during a deposition process, as is recited by the independent claims pending in the instant application.

Based upon the absence of any teaching or even suggestion by the Shufflebotham patent to reduce a ratio of ozone during a deposition process, the pending claims cannot be considered anticipated or obvious in light of this reference. The Examiner's continued rejection of the pending claims is improper and should be withdrawn.

II. **Reiteration of Response to Prior Office Action Mailed July 25, 2002**

In the previous office action mailed July 25, 2002, the Examiner had also rejected the pending claims in view of the Shufflebotham patent. The Shufflebotham patent, is entitled "Method of High Density Plasma CVD Gap-Filling" (Emphasis added) The Shufflebotham patent describes a process for forming oxide over features of a semiconductor device, emphasizing that the high density plasma chemical vapor deposition (HDP-CVD) of oxide suppresses formation of voids in filled features through sputtering of material deposited on feature side walls:

ECR/TCP-CVD ion bombardment plays a key role in the deposition process not only by the activation of surface reactions, but also by simultaneous sputtering that prevents premature closing of the trench top and formation of voids. Sputtering enables high aspect ratio features to be filled from the bottom up. The latter mechanism results in void-free filling of sub-0.5 μm features, a task very difficult to accomplish with

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TEOS and TEOS/O₃ based processes. (Emphasis added; col. 9, lines 11-17)

In contrast to the HDP-CVD, sputter-based approach described in the of the Shufflebotham patent, the instant application does not rely upon or even mention the sputtering action of ions in a high density plasma to ensure gap fill without void formation. Rather, as described in detail in Applicants' prior response, embodiments of deposition processes in accordance with the present invention avoid formation of voids attributable to reentrant side wall cavities in the recesses, by exploiting differing rates of deposition over various portions of the recess and underlying materials. (See Application at Figure 4B and ¶[0017]). Deposition in accordance with the present invention offers a number of advantages over HDP-CVD approaches such as that described by the Shufflebotham patent, including reduced tool complexity, reduced damage to the substrate, and reduced cost.

Accordingly, in responding to the prior office action, independent claims 1, 13, and 20 were amended to highlight the role of differential rates of deposition of the first layer of material on the side walls and bottom of the recess. For the reasons just set forth, Applicant maintains that claims 1, 13, and 20, as previously amended, are not anticipated or obvious when considered in light of the Shufflebotham patent.

To summarize: the Examiner's continued rejection of the pending claims based upon the Shufflebotham patent, alone or in combination with other art, is improper on two separate grounds. First, the Shufflebotham patent teaches an HDP deposition process which relies upon sputtering effects to accomplish filling of recesses from the bottom up. By contrast, the claimed invention relies upon differential rates of deposition on the underlying material to accomplish this result, something that is neither taught nor suggested by the Shufflebotham patent.

Second, the Shufflebotham patent does not suggest, and even teaches away from, deposition of material utilizing a flow of ozone gas. The pending claims have now been amended to require ozone gas during deposition of material.

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Taken alone, either one of these arguments is sufficient to traverse the Examiner's continued reliance upon the Shufflebotham patent to reject the pending claims. Taken together, these arguments certainly overcome the Examiner's rejection of the pending claims as anticipated or obvious in view of the Shufflebotham patent. The Examiner's ongoing claim rejections are therefore improper and should be withdrawn.

In view of the foregoing amendments and remarks, Applicants believe that all claims pending in this application are now in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested. If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 650-326-2400.

Respectfully submitted,



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